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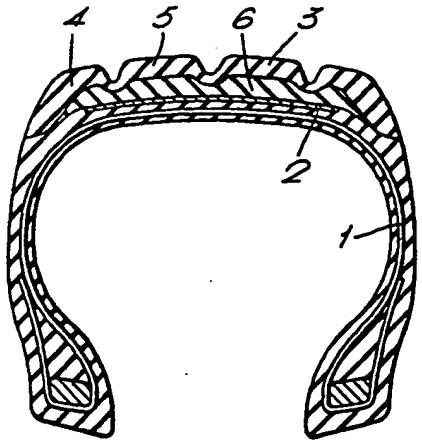
(54) Aircraft tyres.

(57) An aircraft tyre comprising an annular casing (1) and a tread region characterised in that the tread r gion (4) comprises a ground contacting layer (5) of wear resistant tread rubber compound having a hardness greater then 55 I.R.H.D., a resilience of 60 -75% at 50 degrees centigrade measured using the Dunlop pendulum and a high abrasion resistance being at least 120% measured as defined herein and a sub tread layer (6) of damage resistant rubber compound having a hardness greater than 55 I R H D a resilience of 60 - 75% at 50 degr es centigrade measured using the Dunlop pendulum and a tear strength of 260 - 300 Newtons tested accorded to ASTM test No. D624 using Die B.

The resultant tyre has good resistance to casing damage, chunking out of the tread and improved tread wear resistance.

Fig.1.



EP 0 370 664 A2

AIRCRAFT TYRES

This invention relates to a tyre for an aircraft and in particular to a tread construction adapted to provide required properties.

Aircraft tyre treads are subjected to particularly high service conditions and at the high loads and speeds which they operate are prone to generating high temperatures in the tread which may lead to damage to the casing and in some cases "chunk out" of parts of tyre tread itself. Prior constructions have proposed the use of a top cap/sub tread in the tyre tread region using a sub tread material which provides low temperature generation in running of the tyre so that the tyre temperatures are reduced to avoid the problems which may occur. Such tyres however, are still prone to chunking out and the advantages intended by the construction proposed so far have not been successful.

It is an object of the present invention to provide in an aircraft tyre a tyre tread construction which gives resistance to casing damage and chunking out of the tread with the addition of improved wear resistance in the tyre tread.

According to one aspect of the present invention an aircraft tyre is provided comprising an annular casing and a tread region wherein the tread region comprises a ground contacting layer of wear resistant tread rubber compound having a hardness greater than 55 I.R.H.D. a resilience of 60 - 75% at 50 degrees centigrade measured using the Dunlop pendulum and a high abrasion resistance being at least 120% measured as defined herein and a sub tread layer of damage resistant rubber compound having a hardness greater than 55 I R H D, a resilience of 60-75% at 50 degrees centigrade measured using the Dunlop pendulum and a tear strength of 260 - 300 Newtons tested according to ASTM test No. D624 using Die B.

The abrasion resistance was tested using a machine conforming to the DIN 53516 standard. Safety walk was used as the abrasive surface. The formulation of the standard compound used for calculating th abrasion resistance is

SMR 10	100
IRB5	50
Stearic Acid	2
Zinc Oxide	5
CBS	0.5
Sulphur	2.5
IPPD	1.0

The abrasion resistance of the test compound was then defined by abrasion resistance =

$$\frac{\text{volume loss of standard}}{\text{volume loss test compound}} \times 100\%$$

As will be realised this is not a typical top cap/sub tread construction as known in the prior art because the sub tread material properties of hardness and resiliance make it not a conventional low temperature generation compound. Indeed in contrast to the prior art sub tread compounds this particular compound has substantial resistance to damage under shock load which provides the chunk out resistance of the tyre. At the same time the properties chosen for the tread rubber which contacts the ground surface provides high wear resistance.

In a preferred arrangement the wear resistant tread rubber compound has in addition a tear strength greater than 150 Newtons tested according to ASTM D 624 Die B. The wear resistant tread rubber compound is preferably based on natural rubber and butadiene rubber blended where the bl nd contains 10 - 90 parts per 100 of butadiene rubber or more preferably 30 - 50 parts per hundred butadiene.

The sub tread rubber compound preferably is based on natural rubber.

Further aspects of the present invention will be made apparent from the following description, by way of

example only, of one embodiment of the invention in conjunction with the attached diagrammatic drawing which is a cross sectional view of an aircraft tyre.

The tyre shown in the drawing comprises a radial ply aircraft tyre having a main carcass ply reinforcement structure 1 extending from bead to bead around the toroidal air containing chamber of the tyre and a tread reinforcing breaker structure 2 positioned above the central or crown region of the casing 1 between it and the ground engaging tread surface 3.

Between the breaker 2 and the ground engaging tread surface 3 is the tread region of the tyre 4. Th tread region of the tyre comprises a top cap 5 of wear resistant rubber compound and a sub tread layer 6. The compounds for the top cap 5 and sub tread 6 are specially selected to give a good compromise between wear resistance and damage resistance. The top cap rubber compound is a blend of natural rubber and butadiene rubber according to the following formulation.

	Parts per hundred of rubber (pph)
Natural rubber	60
Butadiene rubber	40
Zinc Oxide	5
Stearic acid	2
Carbon black N375	52
Process oil	8
Tack resin	4
Antidegradants	2.5
MBS	1
Sulphur	2.2

The resultant top cap material has a hardness of 63 IRHD, a resilience at 50 degrees centigrade of 69% an abrasion resistance rating of 140 DIN abrasion units and a tear strength of 170 Newtons.

The sub tread material is based on natural rubber and comprises the following formulation.

	Parts per hundred of rubber (pph)
Natural Rubber	100
Zinc Oxide	4
Stearic acid	2
Carbon black N110	30
Carbon black N326	25
Antidegradants	3.5
Sulphur	1
MBS	1.5

The resultant rubber compound has a hardness of 65 IRHD degrees a resilience of 65% at 50 degrees centigrade, an abrasion resistance of 90 and a tear strength of 280 Newtons.

The sub tread material is a particularly damage resistant material and this provides in the ground engaging top cap material great strength to resist chunking out of sections of top cap material. The top cap material provides wear resistance on the tyre.

This tread construction may be used on radial aircraft tyres or on crossply aircraft tyres with advantage.

Claims

1. An aircraft tyre comprising an annular casing (1) and a tread region characterised in that the tread region (4) comprises a ground contacting layer (5) of wear resistant tread rubber compound having a hardness greater than 55 I.R.H.D., a resilience of 60 -75% at 50 degrees centigrade measured using the

Dunlop pendulum and a high abrasion resistance being at least 120% measured as defined herein and a sub tread lay r (6) of damage r sistant rubber compound having a hardness greater than 55 I R H D a resili nce of 60 - 75% at 50 degr es centigrade measured using the Dunlop pendulum and a tear strength of 260 - 300 Newtons tested accorded to ASTM test No. D624 using Die B.

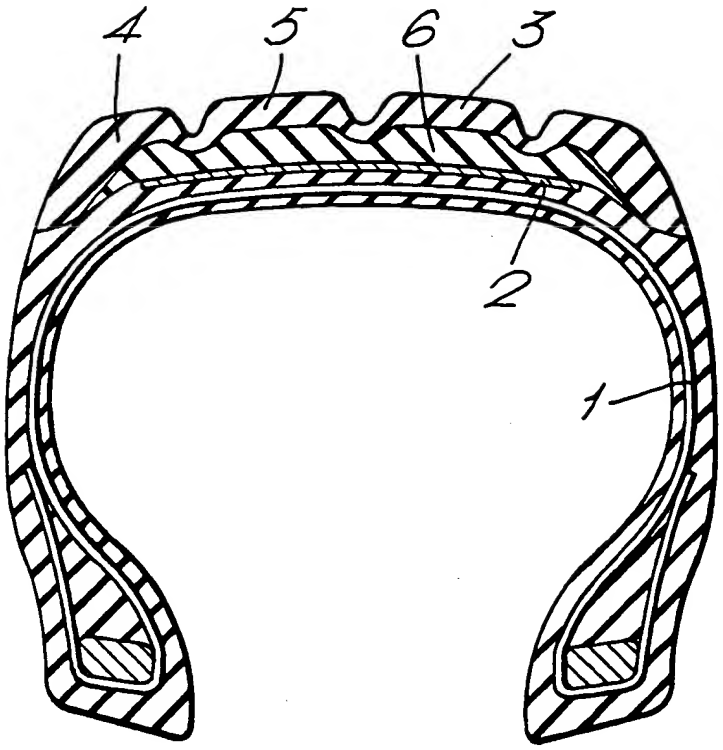
2. A tyre according to claim 1 characterised in that the wear resistant tread rubber compound has a tear strength greater than 150 Newtons tested according to ASTM test No. D624 using Die B

3. A tyre according to claim 1 or 2 characterised in that the wear resistant tread rubber compound comprises a natural rubber and butadiene rubber blend containing 10 to 90 parts per hundred of rubber of butadiene rubber.

4. A tyre according to claims 1 or 2 characterised in that the wear resistant tread rubber compound comprises a natural rubber and butadiene rubber blend containing 30 - 50 parts per hundred rubber of butadiene rubber.

5. A tyre according to any one of claims 1 to 4 characterised in that the sub tread rubber compound comprises natural rubber.

Fig.1.



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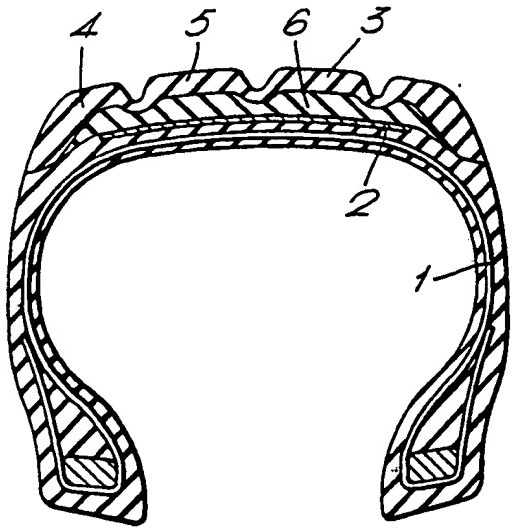

EP 0 370 664 A3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 31 1693

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	US-A-4 396 052 (A. AHAGON) * Column 2, lines 30-45; table 1 *	1,3,5	B 60 C 1/00 B 60 C 11/00
Y	EP-A-0 097 787 (CONTINENTAL) * Page 2, lines 13-17; page 3, lines 17-23 *	1,3,5	
A	LU-A- 64 852 (KLEBER-COLOMBES)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 60 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26-06-1990	SCHMITT L.P.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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